

SEDIMENTARY ROCK ANALYSIS AND CLASSIFICATION						
STEP 1: What is the rock's composition?		STEP 2: What are the rock's textural and other distinctive properties?			STEP 3: Rock Name(s)	
DETRITAL (CLASTIC)	Mainly rock fragments or mineral grains (quartz, feldspar, clay) weathered from other rocks	Mainly gravel ( $\geq 2$ mm)		Rounded grains	CONGLOMERATE	
				Angular grains	BRECCIA	
		Mainly sand ( $1/16 - 2$ mm)		Mostly quartz grains	QUARTZ SANDSTONE	
				Mainly feldspar and quartz	ARKOSE	
				Sand is mixed with much silt and/or clay (mud)	GRAYWACKE	
		Minily Mud ( $< 1/16$ mm)	Mostly silt ( $1/256 - 1/16$ mm)	Breaks into blocks or layers	SILTSTONE	
			Mostly clay ( $< 1/256$ mm)	Crumbles or breaks into blocks	CLAYSTONE	
				Fissile (splits easily)	SHALE	
BIOCHEMICAL: Mainly fossil shells or plant fragments	Mainly plant fragments or charcoal	Dull brown with visible plant fragments		Porous and easy to break apart the plant fragments	PEAT	
		Black		Dense and brittle or porous and sooty	BITUMINOUS COAL	
	Mainly fossil shells, shell fragments, or microfossils  Effervesces in dilute HCl	Mostly visible shells and shell fragments cemented into a dense mass			CALCIRUDITE	
		Mostly sand-sized fragments. May have a few larger shells.			CALCARENITE	
		Mostly very fine grained to microcrystalline mass of calcite and microfossils			MICRITE	
		Porous, poorly cemented mass of shells and shell fragments			COQUINA	
		Mostly very fine grained, earthy, chalky, light-colored mass of microfossils			CHALK	
	CHEMICAL (INORGNIC): Chemically precipitated crystals	Mainly crystals of calcite or aragonite, $\text{CaCO}_3$  Effervesces in dilute HCl	Crystalline to microcrystalline bands of calcite crystals			TRAVERTINE
Spherical grains like tiny beads ( $< 2$ mm) with concentric laminations			OOLITIC LIMESTONE			
Mainly dolomite $\text{CaMg}(\text{CO}_3)_2$		Microcrystalline		Effervesces in dilute HCl only if powdered	DOLOSTONE	
Mainly varieties of quartz, $\text{SiO}_2$ (chalcedony, flint, chert, opal, jasper, etc.)		Microcrystalline, conchoidal fracture		Scratches glass	CHERT	
Mainly halite, NaCl		Crystals formed as inorganic chemical precipitates		Salty taste	ROCK SALT	
Mainly gypsum, $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$		Crystals formed as inorganic chemical precipitates		Can be scratched with your fingernail	ROCK GYPSUM	
Mostly iron-bearing minerals, like limonite and hematite		Amorphous or microcrystalline		Dark-colored, usually brown or red-gray	IRONSTONE	

**FIGURE 6.8** Sedimentary rock analysis and classification. Follow the three steps to analyze and name a sedimentary rock. Refer to text explanation.

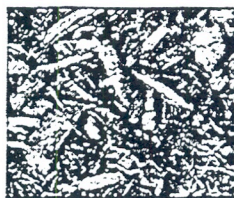


## COMPOSITIONAL CLASSIFICATION OF SEDIMENTARY ROCKS

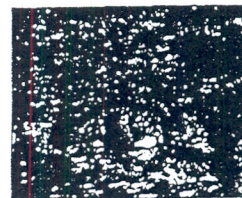
**A. BIOCHEMICAL (ORGANIC)** — comprised mostly of the remains of organisms (plants and animals)



**Shells**  
(fossiliferous limestone or calcarenite)



**Plant Fragments**  
(peat)

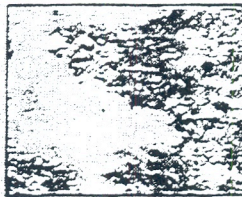


**Carbon**  
(coal)

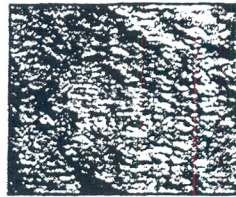
**B. CHEMICAL (INORGANIC)** — comprised mostly of mineral crystals precipitated from aqueous solutions



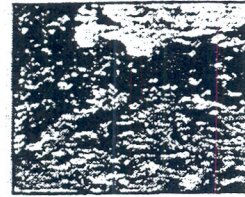
**Gypsum**  
(rock gypsum)



**Halite**  
(rock salt)



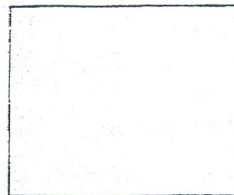
**Hematite**  
(ironstone)



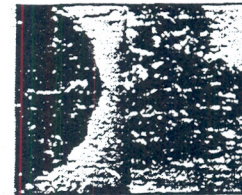
**Limonite**  
(ironstone)



**Calcite Crystals**  
(chemical limestone)

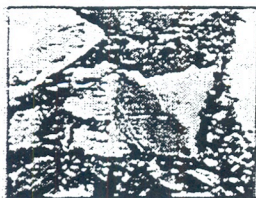


**Dolomite Crystals**  
(dolostone)



**Microcrystalline Quartz**  
(chert)

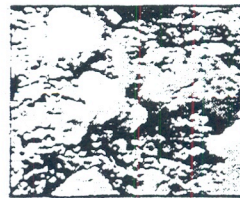
**C. DETRITAL (CLASTIC)** — comprised mostly of pieces of preexisting rocks



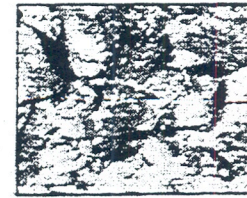
**Rock Fragments**  
(breccia)



**Clay Minerals**  
(claystone, mudstone)



**Quartz Grains**  
(quartz conglomerate)



**Feldspar Grains**  
(arkose)

**FIGURE 6.2** Compositional classification of sedimentary rocks.



METAMORPHIC ROCK ANALYSIS AND CLASSIFICATION								
STEP 1: What are the rock's textural features?			STEP 2: What are the rock's mineralogical composition and/or other distinctive features?		STEP 3: Metamorphic rock name	STEP 4: What was the parent rock?	STEP 5: What is the rock used for?	
FOLIATED	Fine grained	Flat slaty rock cleavage is better developed than foliation	Dull luster; breaks into hard flat sheets along the slaty rock cleavage	SLATE <sup>1</sup>	INCREASING METAMORPHIC GRADE ↓	Mudstone or shale	Roofing slate, table tops, floor tile, and blackboards	
		Wavy foliation well developed more than rock cleavage	Breaks along wrinkled or wavy foliation surfaces with shiny metallic luster	PHYLLITE <sup>1</sup>			Construction stone, decorative stone, sources of gemstones	
	Medium to coarse grained	Schistosity: foliation formed by alignment of visible crystals; rock breaks along scaly foliation surfaces; crystalline texture	Visible sparkling crystals of platy minerals (chlorite, biotite, muscovite), bladed crystals (kyanite), or prismatic crystals (amphiboles, tourmaline, sillimanite); breaks along scaly foliated surfaces	SCHIST <sup>1</sup> Chlorite schist Muscovite schist Biotite schist Kyanite schist Amphibole schist Tourmaline schist Sillimanite schist				
		Gneissic banding: minerals segregated into alternating layers gives the rock a banded texture in side view; crystalline texture	Visible crystals of two or more minerals in alternating light and dark foliated layers	GNEISS <sup>1</sup>				
		FOLIATED OR NONFOLIATED		Medium to coarse grained			Mostly visible crystals of amphibole (usually glossy black hornblende)	AMPHIBOLITE
NONFOLIATED	Fine grained	Glassy texture; rock cleavage may barely be visible	Black glossy rock that breaks along uneven or conchoidal fractures (Figure 7.12)	ANTHRACITE COAL	Peat, Lignite, Bituminous coal	Highest grade coal for clean burning fossil fuel		
		Microcrystalline texture	Usually a dull dark color; very hard	HORNFELS	Any rock type	Decorative stone		
		Microcrystalline texture; may have smooth rock cleavage surfaces or asbestos form	Serpentine; dull or glossy; color usually shades of green	SERPENTINITE	Basalt, Gabbro, or Ultramafic igneous rocks			
		Microcrystalline texture that feels soapy	Talc; can be scratched with your fingernail; shades of green, gray, brown, white	SOAPSTONE				
	Fine to coarse grained	Sandy texture or crystalline texture	Quartz sand grains fused together; grains will not rub off like sandstone, usually light colored	QUARTZITE <sup>1</sup>	Sandstone	Construction stone, decorative stone		
			Calcite (or sometimes dolomite) crystals of nearly equal size and tightly fused together; effervesces in dilute HCl	MARBLE <sup>1</sup>	Limestone	Art carvings, construction stone, decorative stone, source of lime for agriculture		
		Conglomeratic texture, but breaks across grains	Pebbles stretched or cut by rock cleavage	META-CONGLOMERATE	Conglomerate	Construction stone, decorative stone		

<sup>1</sup> Modify rock name by adding names of minerals in order of increasing abundance. For example, garnet muscovite schist is a muscovite schist with a small amount of garnet.

FIGURE 7.15 Five-step chart for metamorphic rock analysis and classification.

**FIGURE 7.19** Metamorphic Rocks Worksheet.

METAMORPHIC ROCKS WORKSHEET					
Sample Letter or Number	Texture(s) (Figures 7.4, 7.15---Step 1)	Mineral Composition and Other Distinctive Properties (Figure 7.15, Step 2)	Rock Name (Figure 7.15, Step 3)	Parent Rock (Figure 7.15, Step 4)	Uses (Figure 7.15, Step 5)